Gellner, C., Perotti, L., Koppenburger, A., Buchem, I., Dietrich, M, Heimann-Steinert, A. (2021) DIGITAL LITERACY OF SENIORS IN THE CONTEXT OF THE ELECTRONIC HEALTH RECORD, ICERI2021 Proceedings, pp. 1297-1306, doi: 10.21125/iceri.2021.0374. Retrieved from https://library.iated.org/view/GELLNER2021DIG

DIGITAL LITERACY OF SENIORS IN THE CONTEXT OF THE ELECTRONIC HEALTH RECORD

C. Gellner[1], L. Perotti[2], A. Koppenburger[3], I. Buchem[1], M. Dietrich[4], A. Heimann-Steinert[2]

[1]Beuth University of Applied Sciences Berlin (GERMANY)
New name from 01.10.2021: Berliner Hochschule für Technik
[2]Charité – Universitätsmedizin Berlin (GERMANY)
[3]RWTH Aachen University (GERMANY)
[4]Deutsches Forschungszentrum für Künstliche Intelligenz GmbH (DFKI) (GERMANY)

Abstract

The introduction of the electronic health record (EHR) (German: Elektronische Patientenakte, ePA) in 2021 as a service offered by health insurance companies is intended to ensure all relevant patient health data availability during treatment. At the same time, the EHR aims to reduce coordinative effort within the healthcare system and improve its processes. On the other hand, it requires a considerable degree of competence on the part of patients (as well as health personnel) in dealing with the digital service. In addition, the electronic health record offers the possibility of inspection and control over health-related data both to health personal and to the patients. However, the use of this digital service depends on the digital literacy of the citizens. For older people, who often have less experience using digital technologies, electronic health record may be a challenge for digital sovereignty in the sense of equal participation in the health care system. The ePA-Coach project addresses this problem and aims to develop an interactive learning platform to support the digital literacy of older people for the competent and self-determined use of the EHR. The basis for the development of the learning platform is the identification and conceptualization of relevant digital competencies for exercising digital sovereignty in the context of the electronic health record. This publication presents the initial competency model, which was developed based on the European Digital Competence Framework (DigComp). Based on a requirements analysis with the target group, we identified subject areas and learning topics for using the EHR and then derived proficiency levels and initial learning objectives. This paper addresses the theoretical foundations, outlines the underlying DigComp Framework, and then describes the ePA-Coach competency model including its learning objectives and methods. Our model is developed iteratively and this paper provides an insight into the initial approach. In the future, our approach could assist researchers and educators in developing digital literacy interventions for senior citizens. This paper ends with the description of future steps in the project and the implications for further research.

Keywords: Digital literacy, DigComp Framework, competency model, senior citizens, e-learning, electronic health record, digital sovereignty, empowerment.

1 INTRODUCTION

As more and more public services are available online, a nation state's technological and a citizens' digital sovereignty is urgently required to utilize those services safely. While fundamental civil rights protect a citizen's sovereignty, this has to be equally assured in the infosphere [1]. However, today, there is no clear understanding of digital sovereignty on the individual level, especially in the context of health care services [2]. A widespread reference point in the discussion about digital sovereignty is the individual's right to informational self-determination, which means the fundamental right to decide which personal data should or should not be recorded and communicated to others. In health services, the exercise of this fundamental right is hampered in many ways, for example, by the knowledge gap between laypeople and health professionals. Thus, sovereignty is not merely a question of transparency and accessibility; the asymmetry is often related to differences in knowing and understanding, e. g. understanding symptoms and their causes. Digital sovereignty is linked to related concepts such as digital and health literacy and the health policy regulation and configuration of available technology. Since 2021, German health insurers have been required by law to provide their patients with electronic health records (EHR) [3]. The health insurers guarantee this in developing and releasing mobile apps and individual access data for each insured person. Health data can be added to the EHR by service providers and the insured persons themselves. The first step includes doctor's letters, medication plans and medical reports, and documents such as the vaccination card or maternity passport. After that, it is up to the insured person to manage this data and, if necessary, to disclose it for certain service providers or forward it to them. The introduction of the electronic health record is intended to support health care without the loss of information and to improve the communication between doctors and patients.

In order to be able to use the electronic health record on a mobile device to its full extent, citizens require competencies and skills in the use of information and communication technologies, such as confident handling of sensitive health data. However, particularly in the population of older people, who can benefit significantly from the advantages of the electronic health record, these skills and competencies are often limited due to a growing amount of health data, limited experience in using mobile devices, and in some cases, declining cognitive abilities. In particular, for older people, digital literacy can mean an enormous gain in freedom, more intensive contact with friends and family, and thus more extended and better participation. However, older adults come into contact with new digital technologies less incidentally and playfully to younger population, so digital literacy needs to be purposefully trained. According to the federal report on older people and digitalization, there are few opportunities to practice digital literacy for older people. [4, 5]. However, the endeavor of empowering patients comes as a highly demanding multifaceted socio-technical development that concerns almost every aspect of the health care system, including the role and the concept of the patient [6].

Against this background, the ePA-Coach project was launched in 2020 funded by the German Federal Ministry of Education and Research, the 3-year project aims to enable older people to use electronic health records and the data they contain confidently. To this end, the project aims to develop micro-content learning units, allowing senior citizens to complete a learning program, which also motivates learning through various gamification elements. In addition, a chatbot supports the learning and AI elements enable individual learning depending on the user's knowledge, resources and interests. The basis for the development of the learning program is the identification and conceptualization of digital competencies for the digital literacy and sovereignty of senior citizens in the context of the electronic health record. This paper presents the initial model of such competencies. First, the theoretical foundations, including the underlying competence framework, is addressed. Second, the methodology for developing the approach is described. Next, the competence concept for the ePA-Coach including the learning objectives is presented using a selected example. Finally, the future steps in the ePA-Coach project and the implications for further research are outlined.

2 DIGITAL LITERACY AND THE DIGCOMP FRAMEWORK

As described before, digital literacy is a factor for the sovereign use of technologies, including the electronic health record. Various terms for digital literacy appear in literature, such as media literacy, information literacy or computer literacy. Digital literacy is usually framed in the context of the effective use of information and communication technology (ICT), and comprises several literacies [7].

In a world of the ongoing digitalization, being digitally competent is a critical factor of a successful coping with a myriad of daily tasks. To help citizens improve their digital competencies, a number of frameworks for digital literacy have been developed [8]. One of these is the *DigComp - The European Digital Competence Framework* developed by the European Commission [9]. This framework in its current Version 2.1 21 compromises competencies which are distributed over five competence areas. In the Austrian version 2.2 AT of the DigComp, all these competencies have been partly adapted, extended, and translated into German. In addition, area number 0 *Basics and access* with three competencies have been added [10]. Table 1 lists the competencies of both framework versions.

Table 1: DigComp 2.1 and DigComp 2.2 AT [9,10]

Competence area	***Competence***	
0. Basics and access[*1*]	0.1	Understanding concepts of digitalization[1]
	0.2	Knowing how to operate digital devices[1]
	0.3	Using/Distributing about inclusive forms to access digital offers[1]
1. Information and data literacy	1.1	Browsing, searching and filtering data, information and digital content
	1.2	Evaluating data, information and digital content
	1.3	Managing data, information and digital content

2. Communication and collaboration	2.1	Interacting through digital technologies
	2.2	Sharing through digital technologies
	2.3	Engaging in citizenship through digital competencies
	2.4	Collaborating through digital technologies
	2.5	Netiquette
	2.6	Managing digital identity
3. Digital content creation	3.1	Digital content creation
	3.2	Integrating and re-elaborating digital content
	3.3	Copyright and licenses
	3.4	Programming
4. Safety	4.1	Protecting devices
	4.2	Protecting personal data and privacy
	4.3	Protecting health and well-being
	4.4	Protecting the environment
5. Problem solving	5.1	Solving technical problems
	5.2	Identifying needs and technological responses
	5.3	Creatively using digital technologies
	5.4	Identifying digital competence gaps

1 Notice: English translations are done by the authors, therefore not official

There exist eight proficiency levels for all competencies, which categorize the users into four kinds of competence mastery. Levels one and two correspond to the *Foundation* mastery level, which means that simple tasks can be performed either fully guided or with guidance where needed. Levels three and four represent the *Intermediate* mastery level, which means that well-defined or routine tasks can be carried out independently, autonomously, and according to the user's needs. Levels five and six stands for *Advanced* competence mastery. Additionally, to carry out given tasks, the person can guide others to fulfil their given tasks and do that by adapting to the needs of the guided person. Finally, levels seven and eight represent the highest levels of proficiency, the so-called *Highly specialized* level. Persons who reach this level can resolve complex problems and propose new ideas and processes to the corresponding field. Questionnaires have been developed to assess the digital competency level of the citizens of the European Union. This assessment can be used during hiring for job application processes to denote the necessary level of digital competencies required for a job position. These assessments can be also used to set learning goals in different educational contexts [9,10]. The DigComp has already been used and implemented in Europe and worldwide in different projects and contexts, such as teacher professional development, student assessment, assessment for employability, and policy support [11]. However, it has not yet been used in digital education or digital literacy for seniors. The framework is age-agnostic and does not specify competencies for older people. The ePA-Coach addresses this issue.

3 THE DEVELOPMENT PROCESS

Following the development of the DigComp, the initial ePA-Coach competence model for the digital literacy of senior citizens in the context of the electronic health record was developed with several steps and methodologies including stakeholder surveys and experts' option. The procedure is shown in Figure 1 and is described below with an additional comparison to the DigComp development process.

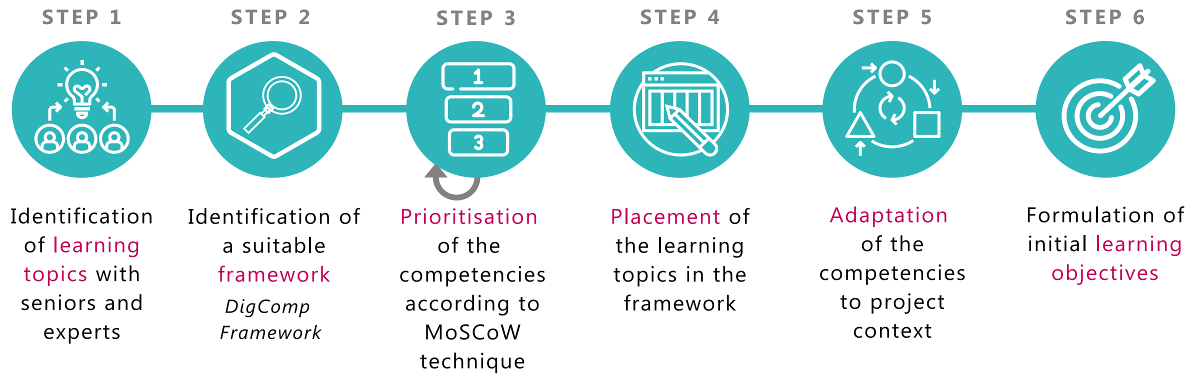
STEP 1
STEP 2
STEP 3
STEP 4
STEP 5
STEP 6
1
2
3
Identification of learning topics with seniors and experts
Identification of a suitable framework DigComp Framework
Prioritisation of the competencies according to MoSCoW technique
Placement of the learning topics in the framework
Adaptation of the competencies to project context
Formulation of initial learning objectives

Figure 1: Procedure for the development of the competency model

The **first step** was to identify relevant learning topics for supporting the digital literacy of older people for competently and self-determined use of the EHR. In the requirements analysis for the ePA-Coach learning application, interviews with the target group and workshops with experts from the EHR field were conducted to collect relevant topics and content for the learning environment. The list of common topic suggestions from the interviews and workshops was supplemented with additional topics by the project consortium members. The requirements analysis and the results are described in [12]. In the DigComp development also experts and stakeholders were initially surveyed for first input and idea generation for a mapping for digital competence [13, 14]. In the **second step**, frameworks or models for digital literacy support were researched, and a suitable framework was identified. The DigComp framework has already been described in section 2.2 and provided the theoretical basis for the ePA-Coach competence model. Primarily the version 2.2 AT was used. In the **third step**, the competencies of the DigComp framework were prioritized using the MoSCoW technique [15] depending on the relevance and feasibility for the project. Thus, the framework could be reduced to the competencies relevant to the project. In addition, it was possible to establish a prioritization within the competencies concerning the importance of the self-determined use of the EHR. This prioritization also supported further planning of learning content creation in the project. This step was iteratively repeated within the next two steps. Also, in the development of the DigComp, the initial competences were assessed by experts for their relevance and reduced according to the results [13,14]. The resulting set of the ePA-Coach competencies was expanded in **step four** by integrating the topics identified by experts and the target group during the requirements analysis. This process was intended to combine the theoretically based competency model with the concrete knowledge requirements of the target group to derive comprehensive and relevant learning content for implementation in the ePA-Coach. Finally, the previous prioritization from step three was adjusted, as the relevant competencies became apparent through the learning topic clustering. Clustering and structuring methodologies were also used in the DigComp development process [13,14]. In **step five**, the remaining competencies were adapted for use in teaching skills for using the EHR. Thus, the competencies that were originally still abstractly formulated in the framework were made more concrete for the area of application focused on in this project. This change in wording made it possible to clarify the relevance of the respective competencies and to sharpen the focus of the single competencies. In addition, the adaptation helped to clarify the definition of competencies even more, and the prioritization was again slightly modified in this step. Also, the DigComp was updated and optimized over the years, e.g. the terms used [16]. Furthermore, based on the proficiency levels of the DigComp framework, three levels (foundations, intermediate and advanced) were derived for the ePA-Coach.

In the **last step**, the learning topics assigned to the ePA-Coach competencies were specified and summarized for the first competencies. The respective learning topics were then assigned to the three proficiency levels, and initial learning objectives were formulated based on the outcome of the analysis. The results of the development process and the proficiency levels are described in the following section.

4 EPA-COACH COMPETENCE MODEL

The following section shows the prioritized competencies, including the assigned learning topics for the ePA-coach for digital literacy for the older people in the context of the electronic health record (EHR). The prioritization resulted from several iterative loops, as described in the previous section.

4.1 Competency model of digital literacy of senior citizens

The competency model of digital literacy of senior citizens in the context of the electronic health record which was developed in the ePA-Coach project is summarized in Figure 2 below. The model extends across all areas of competence of the DigComp framework and includes 17 competencies with a *must (red)*, *should (green)*, or *could (grey)* prioritization. Competences prioritized as *won't* are not included. The total of 58 identified learning topics have been assigned to these competencies.

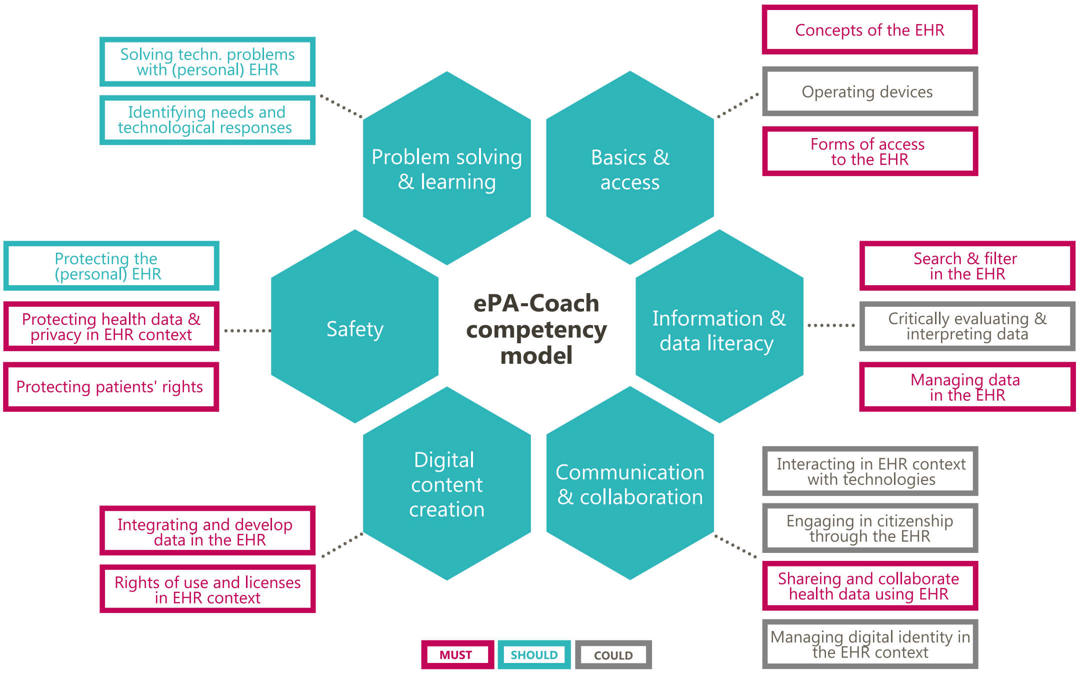
Solving techn. problems with (personal) EHR
Identifying needs and technological responses
Problem solving & learning
Basics & access
Concepts of the EHR
Operating devices
Forms of access to the EHR
Protecting the (personal) EHR
Protecting health data & privacy in EHR context
Protecting patients' rights
Safety
ePA-Coach competency model
Information & data literacy
Search & filter in the EHR
Critically evaluating & interpreting data
Managing data in the EHR
Digital content creation
Communication & collaboration
Integrating and develop data in the EHR
Rights of use and licenses in EHR context
Interacting in EHR context with technologies
Engaging in citizenship through the EHR
Shareing and collaborate health data using EHR
Managing digital identity in the EHR context
MUST
SHOULD
COULD

Figure 2: The competency model of digital literacy of senior citizens in the EHR context

Table 2 shows the nine *must*-have competencies and learning topics. The learning content for these competencies is the first to be conceptualized and implemented for the ePA-Coach learning application. The must-competencies are distributed across all areas of competence except for competence area 5 and include skills on the core functions of the EHR as well as aspects in the field of data protection.

Table 2: ePA-Coach MUST-Competencies

Area	*ID*	*Competence*	*Learning topics*
Basics & access	0.1	Understand concepts of the EHR	Basic terms from the EHR context Basic functions of the EHR Actors of the EHR and their tasks Authorized persons for data maintenance Data that can be stored in the EHR Main components of an EHR Differences EHR and PHR EHR versions and development steps Specific EHR per health insurance fund
	0.3	Know and use forms of access to the EHR	Where can I get the EHR? Special apps from the various health insurances Forms of access to the EHR Authentication (process) Logging into the EHR and setting it up Personal access & activation process Technical access options to the EHR (devices)

Area	*ID*	*Competence*	*Learning topics*
Information & data literacy	1.1	Searching and filtering data, information and digital content in the EHR	Search and find a document in the EHR Search & filter options in the EHR View a document in the EHR Sort functions
	1.3	Managing data, information and digital content in the EHR	Duration of data storage Requirements for subsequent data entry Deleting documents from the EHR
Communication & collaboration	2.2	Sharing and collaborate of health data through the EHR	Grant access rights for doctors, among others Revoke access rights Manage duration of access rights Data use in the EHR (e.g. for research)
Digital content creation	3.2	Integrating and developing digital health data / content in the EHR	Loading documents into the EHR Enter metadata for a document Turn (analogue) documents into usable files Incorporate old health data (e.g. from GDR)
	3.3	Copyright and licenses in the EHR context	Management of access rights Authorized persons for data maintenance Involvement of relatives and deputies Setting up a deputy person
Safety	4.2	Protecting personal data and privacy in the EHR context	Measures to protect sensitive health data
	4.4	Protecting against fraud and abuse of patients' rights in the EHR context	Assess the consequences of data sharing Risk of data misuse and security breaches What are the consequences?

Furthermore, Table 3 shows the three *should*-have competencies and learning topics. The learning content for these competencies will not be developed until the learning content for the must-have competencies is implemented. These competencies consider the fourth and fifth competency areas, including additional skills on safety and problem handling regarding the EHR.

Table 3: ePA-Coach SHOULD-Competencies

Area	*ID*	*Competence*	*Learning topics*
Safety	4.1	Protecting the (personal) EHR	Password creation Consequences of a device loss
Problem solving	5.1	Solving technical problems with the (personal) EHR	Contact person for technical questions about the EHR Problems with the authentication
	5.2	Identifying needs and technological responses in the context of the EHR	Identify responsibilities for the completeness of the correctness of the data Contact for questions regarding the content of the EHR Adjust general settings in the EHR Accessibility (language, font size, brightness etc.)

Finally, Table 4 includes the five *could*-have competencies and learning topics across three competency areas. The learning content for these competencies will not be developed until the learning content for the must- and should-have competencies is implemented. These competencies also partly result from higher-level competencies. For some of these competencies, the learning topic assignment did not result in any topics, so that these would still have to be worked out.

Table 4: ePA-Coach COULD-Competencies

Area	ID	Competence	Learning topics
Basics & access	0.2	Operating (patient) devices for the EHR	--
Information & data literacy	1.2	Critically evaluating and interpreting data, information and digital content in the EHR	Check and recognize the correctness of the data Types of health data Methods for decision-making for doctor-dependent relevance of health data
Communication & collaboration	2.1	Interacting in the EHR context with the help of digital technologies	--
	2.3	Engaging in citizenship through the EHR	Health data donation *Higher-level competence resulting from the other competencies*
	2.6	Managing digital identity in the EHR context	Effects of a change of health insurance *Higher-level competence resulting from the other competencies*

The competencies with *Won't* prioritization, listed in Table 5, include the competencies from the DigComp framework that were deemed rather unsuitable or irrelevant by the project consortium for the ePA-Coach and consequently for supporting digital literacy of senior citizens in the context of the electronic health record. The respective competencies include (A) contents and aspects that are not given in the context of the EHR, for example, programming, making sales or protecting the environment. Some of the competencies are rather (B) general and cross-contextual, making the ePA-Coach too extensive, e.g. netiquette or health protection. Finally, some competencies seemed (C) redundant to other competences to the project consortium in relation to the EHR, e.g. content developing.

Table 5: ePA-Coach WON'T-Competencies

Area	ID	Competence	Unsuitable because …
Communication & collaboration	2.4	Carry out purchases and sales	A
	2.5	Use appropriate forms of expression / Netiquette	B
Digital content creation	3.1	Developing digital content	C
	3.4	Programming	A
Safety	4.3	Protecting health and well-being	B
	4.5	Protecting the environment	A
Problem solving & learning	5.3	Creatively using digital technologies	A, B
	5.4	Identifying digital competence gaps	B

4.2 Competency levels for the ePA-Coach

Based on the proficiency levels 1 to 6 of the DigComp framework, three competency levels were derived for the ePA-Coach as shown in Table 5. Levels 7 and 8 of the DigComp were considered unsuitable for the ePA-Coach. Each competency level is based on the level of task complexity, the level of autonomy needed to complete a task and the cognitive dimension involved in solving the task.

Table 6: Competency levels for the ePA-Coach

Level	Task complexity	Autonomy	Cognitive dimension
Level 1: Beginner	Simple tasks	Independently; with guidance if required	Remember
Level 2: Advanced	Clearly defined tasks; everyday and non-everyday problems	Independently	Understand
Level 3: Expert	Best possible solution for tasks and problems of any kind	Guide others; able to adapt to the needs of others	Apply, evaluate

The implementation of the learning content for level 1 is oriented towards the instructional paradigm and primarily covers the basics on the respective topic. On the other hand, the learning contents for levels 2 and 3 deepen from the first level and are implemented in an application-oriented manner and orientation to the problem-solving paradigm. These paradigms differ in the learning theory basis, the learning objectives and the type of learning content. The instructional paradigm aims more on knowledge transfer and guided learning. In contrast, the problem-solving paradigm focuses more on knowledge building through discovery learning based on problems [16].

4.3 Example: Understanding concepts of the EHR

Taking the example of competence *0.1 Understanding concepts of the EHR*, the assigned topics of this competence were specified, resulting in a total of nine learning topics as shown in Table 7. These topics were assigned to the three competence levels and in a further step initial learning objective were formulated. This competence covers rather general information about the EHR, so that the learning content in all proficiency levels is implemented more according to the instructional paradigm and not according to the problem-solving paradigm as implemented in other competencies, such as "3.2 Integrating and developing digital health data and content in the EHR", in levels 2 and 3.

Table 7: A matrix with learning topics and learning objectives for the three levels of the competence "Understanding EHR concepts"

	Level 1: Beginner	***Level 2: Advanced***	***Level 3: Expert***
Learning topics	Basic terms in the EHR context Basic functions of the EHR Actors of the EHR and their tasks	Authorized persons for data maintenance Data that can be stored in the EHR Main components of the EHR	Differences EHR and PHR EHR versions and development steps Specific EHR per health insurance
Learning objectives	*The learner is able to ...* … associate the most important terms in the EHR context with their meanings. … list the basic functions of the EHR. … name actors of the EHR and allocate their scope of tasks in the EHR context.	*The learner is able to ...* … identify actors and persons generally authorized to maintain data. … give examples of health data stored in the EHR. … derive main components of an EHR.	*The learner is able to ...* … distinguish an EHR from an PHR. … allocate EHR versions and development steps to the respective years.

The matrix is given as an example of one competence. A learning objective was formulated for each learning topic formulated in the requirements analysis in the shown matrix. Then, the matrix is used in the project for each competence. Finally, learning topics and objectives are formulated for each proficiency level, and the learning contents and activities are developed in alignment with the learning objectives. Thus, a learning objective corresponds to one or two micro-learning units.

5 CONCLUSIONS

This paper presents the initial version of the ePA-Coach competency model for supporting digital literacy and sovereignty of the senior citizens which aims to support competent and self-determined use of the electronic health record (EHR). The model was developed based on the European Digital Competence Framework (DigComp), learning topic identification within the requirements analysis with the target group, experts and the project consortium, and prioritization and adaptation of the competencies of the DigComp framework to the project context. The developed ePA-Coach competence model includes 17 corresponding to the MoSCow technique prioritized competencies (must=9, should=3, could=5) and 58 learning topics distributed to these competencies. In addition, the three proficiency levels *beginner*, *advanced* and *expert*, and initial learning objectives for the competence *Understanding concepts of the EHR* were presented. Thus, the model provides an approach to enhancing digital literacy for confident use of the electronic health record. In the future, the approach could assist researchers and educators in developing digital literacy interventions for senior learners, such as online courses, informational materials and interactive content. The further steps in the ePA-Coach project will include iterative evaluations, optimization and extension of the model. In addition, the formulation of learning objectives for all competencies and the development of initial learning content and units are planned.

The ePA-Coach competencies are primarily adapted to the topic of the electronic health record. The adaptation of the competencies to the target group of senior citizens was done rather subtly by prioritising the competencies, but not concretely in differentiation to other target groups such as younger people. Therefore, future research could address the different digital literacy needs of younger and older people concerning the electronic health record. In addition, the process described for developing the ePA-Coach competency model could be repeated at a later stage when the EHR is more established in Germany. The information needs and problems of the users could become more precise, which could lead to a different relevance of the competencies or learning topics. Finally, the current version of the ePA-Coach competency model could help researchers and educators develop digital literacy interventions for older people, but certainly also for younger people or other eHealth applications.

ACKNOWLEDGEMENTS

This publication was produced as part of the project ePA-Coach: Digital sovereignty in the context of the electronic health record, founded by the Federal Ministry of Education and Research under the program Human-technology interaction for digital sovereignty. For more information, please visit https://technik-zum-menschen-bringen.de/projekte/epa-coach

REFERENCES

[1] L. Floridi, *The Onlife Manifesto*. Cham: Springer International Publishing, 2015.

[2] J. Pohle, ‘Digitale Souveränität’, in *Handbuch Digitalisierung in Staat und Verwaltung*, T. Klenk, F. Nullmeier, and G. Wewer, Eds. Wiesbaden: Springer Fachmedien, 2020.

[3] A. Pott, ‘EHR and PHR : Digital records in the German healthcare system’, Mar. 2019. https://www.gesundheitsindustrie-bw.de/en/article/news/ehr-and-phr-digital-records-in-the-german-healthcare-system (accessed Apr. 15, 2021).

[4] Bundesministerium für Familie, Senioren, Frauen und Jugend. „Ältere Menschen und Digitalisierung. Erkenntnisse und Empfehlungen des Achten Altersbericht,“ Berlin, 2020.

[5] D. Schaeffer *et al.*, ‘Gesundheitskompetenz der Bevölkerung in Deutschland vor und während der Corona Pandemie: Ergebnisse des HLS-GER 2’, report, 2021.

[6] U. Felt, S. Öchsner, and R. Rae, ‘The Making of Digital Health: Between Visions and Realizations’, in *Digitaler Humanismus Menschliche Werte in der virtuellen Welt*, J. Fritz and N. Tomaschek, Eds. Münster New York: Waxmann, 2020.

[7] T. Koltay, ‘The media and the literacies: media literacy, information literacy, digital literacy’, *Media, Culture & Society*, vol. 33, no. 2, pp. 211–221, 2011, doi: 10.1177/0163443710393382.

[8] I. Mariën, D. Baelden, and C. Iordache, ‘Developing Digital Skills and Competences: A Quick-Scan Analysis of 13 Digital Literacy Models’, *Italian Journal of Sociology of Education*, vol. 9, no. 02/2017, pp. 6–30, 2017, doi: 10.14658/pupj-ijse-2017-1-2.

[9] S. Carretero Gomez, R. Vuorikari, and Y. Punie, *DigComp 2.1: The Digital Competence Framework for Citizens. With eight proficiency levels and examples of use.* Luxembourg: Publications Office of the European Union, 2017.

[10] Bundesministerium für Digitalisierung und Wirtschaftsstandort, ‘Digitales Kompetenzmodell für Österreich. DigComp 2.2 AT’, Wien, 2018.

[11] European Commission, ‘DigComp Gallery of Implementations’, *European Commission*, 2020. https://ec.europa.eu/jrc/en/digcomp/implementation (accessed Sep. 16, 2021).

[12] L. Perotti and A. Heimann-Steinert, ‘Promoting Self-determined and Informed use of Personal Health Records (PHR) among Older Adults: Assessment of Attitudes Towards the PHR and Requirements for an eLearning Platform’, preprint, Feb. 2021. doi: 10.21203/rs.3.rs-150958/v1.

[13] S. Stoyanov, J. Janssen, and Institute for Prospective Technological Studies, *Online consultation on experts’ views on digital competence.* Luxembourg: Publications Office, 2013.

[14] A. Ferrari, Y. Punie, B. N. Brečko, and Institute for Prospective Technological Studies, *DIGCOMP: a framework for developing and understanding digital competence in Europe.* Luxembourg: Publications Office, 2013.

[15] A. Hudaib, R. Masadeh, M. H. Qasem, and A. Alzaqebah, ‘Requirements Prioritization Techniques Comparison’, *MAS*, vol. 12, no. 2, p. 62, Jan. 2018, doi: 10.5539/mas.v12n2p62.

[16] S. Blömeke and C. Buchholtz, ‘Veränderung von Lehrerhandeln beim Einsatz neuer Medien. Design für die theoriegeleitete Entwicklung, Durchführung und Evaluation einer Intervention’, *MedienPädagogik*, no. MedienPäd.Retro: Jahrbuch Medienpädagogik 5 (2005), pp. 91–106, 2017, doi: 10.21240/mpaed/retro/2017.09.06.X.